Appendix D
Representative Project Planning Methodologies

The following representative decision matrices are provided as examples only of the types of issues and methodologies recommended to be undertaken when planning a prefabrication construction project. The project managers/planners should develop their own planning tools including logic charts, fault trees, scheduling software, decision matrices, etc., with information and criteria specific to their project and they should not be limited to or constrained by the information presented in the following matrices.

The following matrices are divided into two types. The first set of matrices (Matrix E-1 through E-7), designated by an E, is used to qualitatively evaluate a project. The second set of matrices (Matrix S-1 through S-7), designated by an S, is used to numerically select a given feature for a project.

MATRIX E-1 CONTRACT METHOD EVALUATION MATRIX

ITEM	DESIGN BID CONSTRUCT, (100% DESIGN BEFORE BID)		DESIGN-BUILD, (20 TO 35% DESIGN BEFORE BID)		TENDER DESIGN BID CONSTRUCT, (60 TO 75% DESIGN BEFORE BID)	
	ADVANTAGE	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
RISK MANAGEMENT	CURRENTLY THE MOST FAMILIAR METHOD OF CONTRACTING.	RISK THAT DESIGNERS MAY NOT FULLY UNDERSTAND CONTRACTOR'S CONSTRUCTION PLAN.	INTEGRATED DESIGN AND CONSTRUCT TEAM CAN MINIMIZE RISK WITH AN EFFICIENT PLAN.	RISK OF RETAINING POOR DESIGN TEAM	MORE CORPS CONTROL OF DESIGN WHILE BRINGING THE CONTRACTOR INTO THE DESIGN PROCESS.	COMBINATION OF DISADVANTAGES FROM DESIGN BID CONSTRUCT AND DESIGN-BUILD.
RISK SHARING	CORPS CAN USE THEIR FAMILIARITY WITH THE PROJECT TO MINIMIZE RISK.	CORPS ASSUMES MORE RESPONSIBILITY.	RESPONSIBILITY RESTS WITH ONE ENTITY.	CORPS STILL CARRIES SOME RESPONSIBILITY FOR POOR DESIGNS.	MORE CORPS CONTROL OF DESIGN WHILE BRINGING THE CONTRACTOR INTO THE DESIGN PROCESS.	COMBINATION OF DISADVANTAGES FROM DESIGN BID CONSTRUCT AND DESIGN-BUILD.
SCHEDULE	OWNER HAS MOST CONTROL.	SLOWEST	FASTEST	OWNER HAS LEAST CONTROL.	MODERATE ACCELERATION	MULTIPLE INTERFACES.
TECHINICAL QUALIFICATION	POTENTIAL TO SECURE SEPARATELY THE MOST QUALIFIED DESIGNER AND CONTRACTORS.	RESTRICTIONS ON CONTRACTOR QUALIFICATION MAY LIMIT COMPETITION.	THIS METHOD OF CONTRACTING WILL ATTRACT LARGE, TECHNICALLY, QUALIFIED CONTRACTORS.	RESTRICTIONS ON CONTRACTOR QUALIFICATION MAY LIMIT COMPETITION.	CONTRIBUTION TO DESIGN BY MULTIPLE CONCERNED PARTIES.	MOST QUALIFIED DESIGNER CANNOT HANDLE COMPLETE DESIGN.
FINANCIAL QUALIFICATION	TRADITIONAL	POTENTIAL TO ACCEPT A LESS FINANCIALLY QUALIFIED CONTRACTOR BASED ON LOW BID.	THIS METHOD OF CONTRACTING WILL ATTRACT LARGE, FINANCIALLY QUALIFIED CONTRACTORS.	THIS METHOD OF CONTRACTING IS MOST SUITABLE FOR LARGE PROJECTS.	MOST SUITABLE FOR INTERMEDIATE SIZED PROJECTS.	MOST SUITABLE FOR INTERMEDIATE SIZED PROJECTS.

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MATRIX E-1 (CONCLUDED)						
	DESIGN BID CONSTRUCT, (100% DESIGN BEFORE BID)		**DESIGN-BUILD, (20 TO 35% DESIGN BEFORE BID)**		**TENDER DESIGN BID CONSTRUCT, (60 TO 75% DESIGN BEFORE BID)**	
ITEM	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
COST BID	MOST COMPETITION.	LOW-BID PROCUREMENT MAY NOT SECURE MOST QUALIFIED CONTRACTOR.	POTENTIAL FOR LOWEST COST.	REDUCED BID COMPETITION, MORE SUBJECTIVE BID EVALUATION.	INTERMEDIATE COMPETITION WITH POTENTIAL TO CAPTURE SOME SAVINGS BY INVOLVING CONTRACTOR IN THE DESIGN.	INTERMEDIATE POTENTIAL TO MAXIMIZE SAVINGS TO CORPS.
A/E SUPPORT	CORPS CAN SECURE MOST QUALIFIED DESIGNERS.	DESIGNERS ARE REQUIRED TO REMAIN REMOVED FROM CONTRACTOR. POTENTIAL FOR MORE CONFLICT.	DESIGNERS MAY DEVELOP LONG-TERM RELATIONSHIP WITH (AND GAIN UNDERSTANDING OF THE NEEDS OF) THE CONTRACTOR.	DESIGNER MAY BASE DECISIONS ON COST RATHER THAN QUALITY.	THE EXPERIENCE OF TWO DIFFERENT DESIGNERS IS GAINED.	THE MOST QUALIFIED DESIGNER DOES NOT DEVELOP THE COMPLETE DESIGN.
QA/QC	TRADITIONAL.	DESIGNERS MAY NOT FULLY UNDERSTAND CONSTRUCTION METHOD.	DESIGNER FULLY UNDERSTANDS THE CONTRACTOR'S MEANS AND METHODS.	REQUIRES THIRD PARTY VERIFICATION.	INTERMEDIATE CONTROL OF QA/QC.	COMBINATION OF DISADVANTAGES FROM DESIGN BID CONSTRUCT AND DESIGN-BUILD.
VALUE ENGINEERING	TRADITIONAL.	FULL ADVANTAGE OF CONTRACTOR PARTICIPATION IN DESIGN IS NOT CAPTURED AND CORPS ONLY GETS 50% OF SAVINGS.	CONTRACTOR PARTICIPATES IN DESIGN PHASE WITH RESULTING POTENTIAL SAVINGS.	SAVINGS FROM CONTRACTOR INNOVATION MUST BE CAPTURED IN DESIGN/BUILD BID PROCESS, NOT BY VALUE ENGINEERING.	INTERMEDIATE POTENTIAL SAVINGS TO CORPS.	POTENTIAL SAVING BY INVOLVING CONTRACTOR IN THE EARLY DESIGN IS NOT REALIZED.
PRESCRIPTIVE SPECIFICATION	MOST SUITABLE FOR PRESCRIPTIVE SPECIFICATION	OVER PRESCRIPTION MAY INCREASE COST AND/OR CORPS LIABILITY.	ANY PRESCRIPTIVE SPECIFICATION IS CUSTOMIZED TO CONTRACT MEANS AND METHODS.	LEAST SUITABLE FOR PRESCRIPTIVE SPECIFICATION.	INTERMEDIATE SUITABILITY.	NONOPTIMIZED USE OF SPECIFICATION
PERFORMANCE SPECIFICATION	TRADITIONAL	LEAST SUITABLE FOR PERFORMANCE SPECIFICATION	MOST SUITABLE FOR PERFORMANCE SPECIFICATION	REQUIRES CAREFUL MONITORING OF CONSTRUCTION	INTERMEDIATE SUITABILITY	NONOPTIMIZED USE OF SPECIFICATION

MATRIX E-2 RECONNAISANCE LEVEL RISK/CONTINGENCE EVALUATION MATRIX

	CONSTRUCTION		NAVIGATION		SCHEDULE	
ITEM	**RISK/CAUSATIVE**	**MITIGATION**	**RISK/CAUSATIVE**	**MITIGATION**	**RISK/CAUSATIVE**	**MITIGATION**
DIVERS	CURRENTS. VISIBILITY. POOR PLANNING. POOR COMMUNICATION.	GOOD PLANNING. GOOD COMMUNICATION. SAFETY LINES. TAUT LINES. TEAMWORK. LIMITED WATER VELOCITY FOR DIVING. ETC.	LIABILITY FOR HARMING DIVERS.	MAINTAIN SAFETY ZONE. SCHEDULE WORK WHEN THERE IS NO TRAFFIC. USE BARRIERS. IMPROVE CONTROL OF TRAFFIC.	POOR PRODUCTIVITY FROM DIVER. DIVERS MAY PROHIBIT CONCURRENT WORK IN SAME AREA.	MINIMIZE USE OF DIVERS BY USE OF TEMPLATES, GUIDES, SONIC IMAGING, ETC. IMPROVE DIVER PRODUCTIVITY BY: PROVIDING REACTION POINTS, TOOLS, ETC.
IMPACT FROM NAVIGATION	PROXIMITY OF TRAFFIC TO CONSTRUCTION AND LIMITED CONTROL OF TRAFFIC. LIMITED WORKING PERIOD OR WORK INTERRUPTION.	PROVIDE PILOT, PROVIDE HELP BOAT, RADAR, BARRIERS. CONSTRUCTION SEQUENCE. MINIMIZE INSTALLATION DURATION. ETC.	LIABILITY FOR IMPACT. DELAYS TO AVOID CONSTRUCTION	ACCELERATE-MINIMIZE CONSTRUCTION IN THE RIVER. SAFETY ZONE. SCHEDULING; BARRIERS. TRAFFIC CONTROL. PHYSICAL MODELS AT ERDC.. USE OF SIMULATORS. ANALYZE HISTORIC DATA.	CONSTRUCTION PERIODS MAY BE LIMITED BY THE NEED TO ACCOMMODATE TRAFFIC. LIMITED WORKING PERIOD OR WORK INTERRUPTION.	PLAN ACCORDINGLY. ACCELERATE CONSTRUCTION IN THE RIVER.
WORK IN CONFINED SPACES	RISK OF ACCIDENT-VENTILATION-FIRE IN SPACES SUCH AS DEWATERED SHELLS AND AREAS BETWEEN BULKHEADS.	VENTILATION. FIRE CONTROL. EVACUATION PLAN. COMMUNICATIONS. LIMIT AMOUNT OF CONFINED WORK.	MINIMAL RISK EXCEPT FOR IMPACT AGAINST CONFINED SPACE.	SEE MEASURES FOR CONTROLLING IMPACT (ABOVE).	POOR PRODUCTIVITY IN CONFINED SPACES.	MINIMIZE WORK IN CONFINED SPACES. USE MORE MECHANICAL DEVICES.
WORK WITH HEAVY LIFTS	WORKING NEAR THE RATED CAPACITY OF CRANES CAN POSE RISKS OF CONTROL, STABILITY AND COLLAPSE.	USE EQUIPMENT WITH ADEQUATE RATING; STABILIZE FLOATING CRANES WITH: SPUDS, OUTRIGGERS, OR REACTING AGAINST THE STRUCTURE.	MOVEMENT AND OPERATION OF CRANE BARGES CAN POSE RESTRICTIONS ON TRAFFIC.	SCHEDULING. USE OF LARGER PREFAB. UNITS.	POTENTIAL DELAY DUE TO AN ACCIDENT.	USE CERTIFIED EQUIPMENT IN GOOD CONDITION, OPERATED BY TRAINED PERSONNEL.

(SHEET 1 OF 3)

MATRIX E-2 (CONTINUED)						
	CONSTRUCTION		NAVIGATION		SCHEDULE	
ITEM	**RISK/CAUSATIVE**	**MITIGATION**	**RISK/CAUSATIVE**	**MITIGATION**	**RISK/CAUSATIVE**	**MITIGATION**
TRANSPORT PHASE	SINKING. DROPPING. IMPACT. WEATHER. RIVER STAGE. DRAFT. BRIDGE RESTRICTIONS. TRAFFIC RESTRICTIONS.	CERTIFYING. INSPECTING. COMMISSIONING. SCHEDULING. PLANNING.	TRANSPORT OF ELEMENTS CAN POSE RESTRICTIONS ON TRAFFIC.	CERTIFYING. INSPECTING. COMMISSIONING. SCHEDULING. PLANNING.	POTENTIAL DELAY DUE TO AN ACCIDENT.	CERTIFYING. INSPECTING. COMMISSIONING. SCHEDULING. PLANNING.
TREMIE STOPPAGE	INTERRUPTION OF CONCRETE SUPPLY CAN CAUSE COLD JOINTS, AND VOIDS.	REDUNDANCE IN CONCRETE SUPPLY. STEEL ACROSS POTENTIAL COLD JOINTS. HIGH PRESSURE WATER JETS TO CLEAN JOINT.	MINIMAL RISK.	AVOID IMPACT DURING TREMIE PLACEMENT.	POTENTIAL DELAY DUE TO AN ACCIDENT. POTENTIAL DELAY WHILE ADDRESSING POOR CONCRETE.	USE NEW EQUIPMENT. PROVIDE REDUNDANCE. TRAINED PERSONNEL. PLAN EXECUTION.
WORK WITH HIGH-PRESSURE TOOLS	ACCIDENT FROM: JACKS, RAMS, CUTTING TOOLS, WATER JETS, ETC.	USE TRAINED PERSONNEL AND FOLLOW PRESCRIBED SAFETY PROCEDURES.	MINIMAL RISK.	------	POTENTIAL DELAY DUE TO AN ACCIDENT.	USE NEW EQUIPMENT. PROVIDE REDUNDANCE. TRAINED PERSONNEL. PLAN EXECUTION.
HAZARDOUS WEATHER	HIGH WINDS, LIGHTNING. HEAVY RAIN. FREEZING. ETC.	ALLOWANCE FOR WEATHER DAYS. AVOID WORK IN ADVERSE SEASONS. USE PREFABRICATION FACILITIES WITH COVERED WORK AREAS.	SAME AS CURRENT SITUATION.	-------	POTENTIAL WEATHER DELAYS. NARROW CONSTRUCTION WINDOWS OF OPPORTUNITY, AND DELAYS WAITING FOR WINDOWS.	ALLOWANCE FOR WEATHER DAYS. AVOID WORK IN ADVERSE SEASONS. USE PREFABRICATION FACILITIES WITH COVERED WORK AREAS.
HAZARDOUS RIVER CONDITIONS	RAPID RIVER RISE DUE TO STORMS. HIGH WATER VELOCITIES. MOVING RIVER BOTTOM.	AVOID IN-RIVER WORK IN ADVERSE SEASONS. MOORING LINES. SPUD PILES. DOLPHINS. TEMPORARY SCOUR PROTECTION. FLOW DEFLECTORS.	SAME AS CURRENT SITUATION.	---------	POTENTIAL DELAYS DUE TO ADVERSE RIVER CONDITIONS.	PROVIDE ALLOWANCE IN SCHEDULE FOR DELAYS.
(SHEET 2 OF 3)						

MATRIX E-2 (CONCLUDED)

ITEM	CONSTRUCTION		NAVIGATION		SCHEDULE	
	RISK/CAUSATIVE	**MITIGATION**	**RISK/CAUSATIVE**	**MITIGATION**	**RISK/CAUSATIVE**	**MITIGATION**
TOLERANCE-CONNECTION PROBLEMS	EXCESSIVE DEVIATION FROM DESIGN REQUIRING CORRECTION.	ADJUST UNIT BEFORE PLACING TREMIE. CUTTING WITH: WATER JETS, THERMO-LANCE, SAWS, ETC. GROUT INJECTION.	MINIMAL	--------	POTENTIAL DELAY UNTIL REPAIR DETERMINED.	RAPID RESPONSE TO REPAIR ERROR.
SINKING-DROPPING UNIT	SINKING A FLOATING UNIT, OR DROPPING A LIFTED ELEMENT.	SUNKEN UNITS CAN SOMETIMES BE REFLOATED. DROPPED ELEMENTS CAN SOMETIMES BE PICKED UP.	SINKING IN THE MAIN CHANNEL CAN POSE AN OBSTRUCTION TO TRAFFIC.	DREDGE BY-PASS CHANNEL. REMOVE OBSTRUCTION.	DELAY DUE TO POTENTIAL LOSS OF ELEMENTS	RAPID RESPONSE TO REPAIR OR REPLACE DAMAGED UNITS.

(SHEET 3 OF 3)

MATRIX E-3 CONSTRUCTION SCHEDULE EVALUATION MATRIX						
	FLOAT-IN METHOD		**HEAVY LIFT-IN METHOD**		**LIGHT LIFT-IN METHOD**	
ITEM	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
NAVIGATION	QUICK INSTALLATION TIME CAN MINIMIZE EFFECT ON NAVIGATION.	RISK OF IMPACT DURING TOW AND INSTALLATION CAUSING DELAYS.	RELATIVELY QUICK INSTALLATION AND ABILITY TO DEPLOY AND WITHDRAW QUICKLY.	HEAVY-LIFT EQUIPMENT IS SUBJECT TO IMPACT, CAUSING DELAYS.	ABILITY TO DEPLOY AND WITHDRAW QUICKLY, MAY REDUCE DISRUPTION TO NAVIGATION.	LIGHT-LIFT EQUIPMENT AND SMALL UNITS ARE SUBJECT TO IMPACT, CAUSING DELAYS.
OUT-LOADING	LOAD-OUT CAN BE TIMED TO MATCH PERIOD OF APPROPRIATE RIVER STAGE.	OPTIMAL PERIODS FOR LOAD-OUT MAY NOT MATCH OPTIMAL TIMES FOR TRANSPORT AND INSTALLATION.	YEAR-ROUND LOAD-OUT CAN TYPICALLY BE PROVIDED BY SKIDWAYS, OR OTHER LOAD-OUT METHODS.	LESS EXPENSIVE LOAD-OUT SYSTEMS MAY IMPOSE SCHEDULING RESTRICTIONS.	LOAD-OUT CAN TYPICALLY BE ACCOMMO-DATED YEAR-ROUND	LOAD-OUT OF LIGHT UNITS MAY BE ADVERSELY AFFECTED BY SEASONAL RIVER CONDITIONS.
RIVER CONDITIONS	MAXIMIZED OFFSITE PREFABRI-CATION MAY MINIMIZE EXPOSURE TIME TO RIVER CONDITIONS.	RIVER CURRENTS AND DRAFT REQUIRE-MENTS MAY ADVERSELY AFFECT FLOAT-IN OPTIONS, AND BOTTOM PREPARATION.	LESS AFFECTED BY RIVER CONDITIONS THAN LIGHT LIFT-IN METHOD.	RIVER CONDITIONS CAN DELAY PREPARATORY AND INSTALLATION WORK.	USE OF FRAMES AND GUIDES CAN REDUCE THE INFLUENCE OF RIVER CONDITIONS ON THE METHOD.	MAXIMIZES DURATION OF EXPOSURE TO RIVER CONDITIONS.
WEATHER CONDITIONS	CAN MINIMIZE TIME OF EXPOSURE TO BAD WEATHER IN THE RIVER.	OFFSITE PREFABRICA-TION FACILITY MAY BE DIFFICULT TO PROTECT FROM WEATHER.	OFFSITE PREFABRICATION AND USE OF LARGE EQUIPMENT CAN REDUCE WEATHER DELAYS.	EXPENSIVE EQUIPMENT CAN INCREASE PENALTY DUE TO DOWNTIME.	STAND-DOWN TIME IS LESS COSTLY DURING BAD WEATHER.	MAXIMIZES DURATION OF EXPOSURE TO WEATHER ON THE RIVER.
REAL ESTATE PERMITS	CONSTRUCTION ON A BARGE WHICH DOES NOT REQUIRE A PERMIT.	LONG LEAD TIME CAN BE REQUIRED TO PERMIT NEW OFFSITE FACILITIES.	CONSTRUCTION ON A BARGE OR IN AN EXISTING FACILITY MAY NOT REQUIRE PERMITTING.	LONG LEAD TIME CAN BE REQUIRED TO PERMIT NEW OFFSITE FACILITIES.	EXITING FACILITIES MAY EXIST THAT DO NOT REQUIRE PERMITTING.	LONG LEAD TIME CAN BE REQUIRED TO PERMIT NEW OFFSITE FACILITIES.

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MATRIX E-3 (CONCLUDED)

	FLOAT-IN METHOD		HEAVY LIFT-IN METHOD		LIGHT LIFT-IN METHOD	
ITEM	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
ENVIRONMENT REPORTS	CONSTRUCTION ON A BARGE, WHICH DOES NOT REQUIRE A REPORT, IS AN OPTION.	LONG LEAD TIMES CAN BE REQUIRED FOR REPORTS FOR NEW OFFSITE FACILITIES.	CONSTRUCTION ON A BARGE OR IN AN EXISTING FACILITY MAY NOT REQUIRE A REPORT.	LONG LEAD TIMES CAN BE REQUIRED FOR REPORTS FOR NEW OFFSITE FACILITIES.	CONSTRUCTION ON A BARGE OR IN AN EXISTING FACILITY MAY NOT REQUIRE A REPORT.	LONG LEAD TIMES CAN BE REQUIRED FOR REPORTS FOR NEW OFFSITE FACILITIES.
CULTURAL REPORTS	CONSTRUCTION ON A BARGE, WHICH DOES NOT REQUIRE A REPORT, IS AN OPTION.	LONG LEAD TIMES CAN BE REQUIRED FOR REPORTS FOR NEW OFFSITE FACILITIES.	CONSTRUCTION ON A BARGE OR IN AN EXISTING FACILITY MAY NOT REQUIRE A REPORT.	LONG LEAD TIMES CAN BE REQUIRED FOR REPORTS FOR NEW OFFSITE FACILITIES.	CONSTRUCTION ON A BARGE OR IN AN EXISTING FACILITY MAY NOT REQUIRE A REPORT.	LONG LEAD TIMES CAN BE REQUIRED FOR REPORTS FOR NEW OFFSITE FACILITIES.
TRIAL TESTS	CAN TYPICALLY BE ACCOMMODATED IN THE CONSTRUCTION SCHEDULE.	UNUSUAL FLOATING SHAPES MAY REQUIRE TESTING FOR CLASSIFICA-TION AND COMMISSIONING.	CAN TYPICALLY BE ACCOMMODATED IN THE CONSTRUCTION SCHEDULE.	PLACEMENT PROCEDURES AND TREMIE CONCRETE OPERATIONS MAY REQUIRE TRIAL TESTS.	CAN TYPICALLY BE ACCOMMO-DATED IN THE CONSTRUCTION SCHEDULE.	PLACEMENT PROCEDURES AND TREMIE CONCRETE OPERATIONS MAY REQUIRE TRIAL TESTS.
STAND-DOWN CONCERNS	RAPID DEPLOYMENT AND MAXIMIZED OFFSITE PREFABRICATION CAN REDUCE EXPOSURE TO DOWNTIME	LARGE FLOATING UNITS MAY REQUIRE LOAD DOWNTIME UNIT WINDOWS OF OPPORTUNITY ALLOW FOR TOW AND INSTALLATION.	LARGE EQUIPMENT IS GENERALLY WELL MAINTAINED AND CAN WORK IN ADVERSE CONDITIONS.	DOWNTIME CAN BE COSTLY DUE TO USE OF EXPENSIVE EQUIPMENT.	COST OF DOWN-TIME IS NOT AS EXPENSIVE AS FOR HEAVY-LIFT METHOD.	LIGHT EQUIPMENT MAY NOT BE ABLE TO WORK IN ADVERSE CONDITIONS.
OFFSITE CONCERNS	ALLOWS PARALLEL CONSTRUCTION	MAY REQUIRE LONG TOW FROM EXISTING FACILITIES.	ALLOWS PARALLEL CONSTRUCTION	LOAD-OUT AND TRANSPORT MAY POSE COMPLICATIONS	MANY EXISTING SITES MAY BE AVAILABLE.	MAXIMIZES DURATION OF EXPOSURE TO RIVER CONDITIONS.
COMMISSIONING EXERCISES	CAN BE SCHEDULED INTO THE CONSTRUC-TION PLAN.	REQUIRED PRIOR TO TRANSPORT	PRE-EXISTING HEAVY-LIFT EQUIPMENT HAS ALREADY BEEN COMMISSIONED	NEW HEAVY-LIFT EQUIPMENT WILL REQUIRE COMMISSIONING.	PRE-EXISTING LIGHT-LIFT EQUIPMENT HAS ALREADY BEEN COMMISSIONED	NOT NORMALLY REQUIRED.

MATRIX E-4 SITE PREPARATION EVALUATION MATRIX

ITEM	ROCK FOUNDATION		SAND FOUNDATION		COHESIVE MATERIAL FOUNDATION	
	POTENTIAL SOLUTIONS	POTENTIAL PROBLEMS	POTENTIAL SOLUTIONS	POTENTIAL PROBLEMS	POTENTIAL SOLUTIONS	POTENTIAL PROBLEMS
EXCAVATION OR DREDGING	MULTIPLE METH-ODS AVAILABLE INCLUDING: DRILL-ING A BLASTING; RIPPING; LINE DRILLING; JACK-HAMMERING, CLAMSHELLING; ETC. ALSO ABILITY TO DEPLOY & WITHDRAW RAPIDLY.	ROCK EXCAVATION CAN BE TIME CONSUMING AND MAY REQUIRE BREAKING THE WORK INTO STAGES WITH RAPID DEPLOYMENT AND WITHDRAWAL TO ALLOW TRAFFIC TO PASS.	IF SUCTION DREDGING IS PERMITTED THIS CAN BE EXCAVATED RAPIDLY, OTHERWISE CLAMSHELLING IS PRACTICABLE.	SANDY RIVER BOTTOMS ARE SUBJECT TO MIGRATION AND MAY REQUIRE SEDIMENT TRAPS TO KEEP EXCAVATIONS OPEN.	TYPICALLY NOT SUBJECT TO MIGRATION. IF PERMITTED, CAN BE EXCAVATED BY SUCTION DREDGING WITH A CUTTER-HEAD; OTHERWISE CLAMSHELLING, DRAGLINING, OR BACKHOEING, IS PRACTICABLE	EXCAVATION CAN LOCALLY DEGRADE THE PROPERTIES OF THE COHESIVE MATERIAL.
SOIL MODIFICATION	GROUTING OR BY-PASSING FRACTURED ZONES IS PRACTICABLE.	THIS WORK CAN BE EXPENSIVE WITH UNCERTAIN RESULTS.	VIBRO-DENSIFICATION IS PRACTICABLE	EXPENSE AND TIME ASSOCIATED WITH MODIFICATION.	MULTIPLE METHODS EXIST SUCH AS: SOIL MIXING, JET-GROUTING, ETC.	EXPENSE, TIME, AND UNCERTAINTY ASSOCIATED WITH MODIFICATION.
BACKFILL	USE OF BACKFILLING OVER ROCK CAN MINIMIZE SURFACE PREPARATION FOR FOUNDATIONS.	IT MAY BE PREFERABLE TO FOUND DIRECTLY ON ROCK RATHER THAN ON A BACKFILL MATERIAL.	BACKFILL CAN BE USED ALSO FOR: SCOUR PROTECTION, DRAINAGE LAYERS, FILTER LAYERS, AND SCREED LAYERS.	CARE MUST BE TAKEN TO PROVIDE FILTERING ACTION EITHER WITHIN OR AROUND THE BACKFILL.	USE OF BACKFILLING OVER COHESIVE MATERIAL CAN MINIMIZE SURFACE PREPARATION FOR FOUNDATIONS.	EXPENSE AND TIME ASSOCIATED WITH BACKFILL.
SCREEDING	SCREEDING BACKFILL ON TOP OF ROCK CAN MINIMIZE SURFACE PREPARATION.	IT MAY BE PREF-ERABLE TO FOUND DIRECTLY ON ROCK RATHER THAN ON A BACKFILL MATERIAL.	MULTIPLE OPTIONS SUCH AS: DRAG BEAM, BOTTOM SCREED FRAME, FLOATING SCREED SYSTEMS, AUGER SYSTEMS, ETC.	MORE PRECISE SCREEDING CAN SIGNIFICANTLY INCREASE COSTS.	SCREEDING BACKFILL ON TOP OF COHESIVE MATERIAL CAN MINIMIZE SURFACE PREPARATION.	EXPENSE AND TIME ASSOCIATED WITH BACKFILL, AND SCREEDING.
TEMPORARY SCOUR PROTECTION	TYPICALLY NOT REQUIRED.	TYPICALLY NOT REQUIRED.	ARTICULATED MATS AND INTERMEDIATE SIZED SCOUR STONE CAN BE USED.	COST AND INFLUENCE ON CONSTRUCTION SEQUENCE-SCHEDULE MUST BE CONSIDERED.	ARTICULATED MATS AND INTERMEDIATE SIZED SCOUR STONE CAN BE USED.	COST AND INFLUENCE ON CONSTRUCTION SEQUENCE-SCHEDULE MUST BE CONSIDERED.

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MATRIX E-4 (CONCLUDED)						
	ROCK FOUNDATION		**SAND FOUNDATION**		**COHESIVE MATERIAL FOUNDATION**	
ITEM	**POTENTIAL SOLUTIONS**	**POTENTIAL PROBLEMS**	**POTENTIAL SOLUTIONS**	**POTENTIAL PROBLEMS**	**POTENTIAL SOLUTIONS**	**POTENTIAL PROBLEMS**
PERMANENT SCOUR PROTECTION	TYPICALLY NOT REQUIRED.	TYPICALLY NOT REQUIRED.	TECHNOLOGY EXISTS TO SURVEY THE STONE LAYER UNDERWATER THUS POTENTIALLY ALLOWING FOR USE OF THINNER LAYERS.	STONE LAYERS PLACED UNDERWATER MUST BE THICKER THAN WHEN PLACED IN-THE-DRY.	TECHNOLOGY EXISTS TO SURVEY THE STONE LAYER UNDERWATER THUS POTENTIALLY ALLOWING FOR USE OF THINNER LAYERS.	STONE LAYERS PLACED UNDERWATER MUST BE THICKER THAN WHEN PLACED IN-THE-DRY.
SEDIMENT CONTROL	MAY OR MAY NOT, BE REQUIRED.	MAY OR MAY NOT, BE REQUIRED.	SHEET-PILE WALLS AND SEDIMENT TRAP TRENCHES CAN BE EFFECTIVE.	SAND WAVES, AND RUNNING SANDS MAY REQUIRE EXTRA MEASURES.	SHEET-PILE WALLS AND SEDIMENT TRAP TRENCHES CAN BE EFFECTIVE.	MIGRATING MUD CAN BE DIFFICULT TO CONTROL.
FOUNDATION	FOUNDING DIRECTLY ON ROCK CAN BE COST EFFECTIVE.	WEAK LAYERS AND WEATHER ZONES MAY REQUIRE EXTRA MEASURES.	FRICTION AND/OR END BEARING PILES, OR DRILLED SHAFTS, ARE EFFECTIVE.	PILE DRIVING MAY OR MAY NOT BE HARD, AND DRILLED SHAFTS CAN BE SLOW.	FRICTION AND/OR END BEARING PILES, OR DRILLED SHAFTS, ARE EFFECTIVE.	PILE DRIVING MAY OR MAY NOT BE HARD, AND DRILLED SHAFTS CAN BE SLOW.
SUBSTRUCTURE	PRECAST CON-CRETE GRAVITY STRUCTURES, OR STRUCTURE WITH ROCK ANCHORS CAN BE USED EFFECTIVELY	IF THE SUBSTRUCTURE IS DEWATERED, CARE SHOULD BE TAKEN TO AVOID LIFT-OFF FROM THE ROCK.	TIE-IN OF SUBSTRUCTURE TO PILES/SHAFTS CAN BE ACCOMPLISHED WITH TREMIE CONCRETE OR GROUT.	THE QUALITY OF THE FOUNDATION-SUBSTRUCTURE CONNECTION MAY REQUIRE VERIFICATION UNDERWATER.	TIE-IN OF SUBSTRUCTURE TO PILES/SHAFTS CAN BE ACCOMPLISHED WITH TREMIE CONCRETE OR GROUT.	THE QUALITY OF THE FOUNDATION-SUBSTRUCTURE CONNECTION MAY REQUIRE VERIFICATION UNDERWATER.
DISPOSAL ISSUES	EXCAVATED ROCK CAN SOMETIMES BE DISPOSED OF AS BACKFILL.	DISPOSAL OF EXCAVATED ROCK MAY REQUIRE PROCESSING.	DREDGED SAND CAN SOMETIMES BE DISPOSED OF AS BACKFILL.	ON-SHORE DISPOSAL MAY BE REQUIRED.	DREDGED COHESIVE MATERIAL CAN SOMETIMES BE DISPOSED OF AS BACKFILL.	ON-SHORE DISPOSAL MAY BE REQUIRED.
ENVIRONMENT ISSUES	ROCK EXCAVATION HAS REDUCED RISK OF INTRODUCING FINES INTO THE WATER COLUMN.	DRILLING AND BLASTING CAN CAUSE SHOCK WAVES.	DREDGING OF CLEAN SANDS AND GRAVEL MAY POSE LITTLE RISK TO THE ENVIRONMENT.	RESTRICTIONS MAY BE PLACED ON DREDGING, TO AVOID THE INTRODUCTION OF FINES INTO THE WATER COLUMN.	EXCAVATION OF STIFF COHESIVE MATERIAL MAY POSE LITTLE RISK TO THE ENVIRONMENT.	RESTRICTIONS MAY BE PLACED ON DREDGING, TO AVOID THE INTRODUCTION OF FINES INTO THE WATER COLUMN.

MATRIX E-5 INSTALLATION METHOD EVALUATION MATRIX

ITEM	GUIDANCE SYSTEMS ADVANTAGE	GUIDANCE SYSTEMS DISADVANTAGE	STATION KEEPING SYSTEMS ADVANTAGE	STATION KEEPING SYSTEMS DISADVANTAGE	STABILITY ADVANTAGE	STABILITY DISADVANTAGE
STABBING SYSTEMS	WIDELY USED. SIMPLE. COST EFFECTIVE. RELIABLE. FREQUENTLY TAPERED AND/OR STEPPED. CAN GUIDE IN ONE OR TWO DIRECTIONS.	STATIC SYSTEM, WITH A POTENTIAL FOR "HANGING-UP" THE OBJECT BEING INSTALLED.	PRE-INSTALLED STABBING PILES HAVE BEEN USED FOR STATION KEEPING IMMEDIATELY BEFORE SET-DOWN	SELDOMLY USED FOR STATION KEEPING, EXCEPT IMMEDIATELY BEFORE INSTALLATION.	COULD BE COMBINED WITH TAUT LINES FOR INSTALLATION STABILITY.	NOT NORMALLY USED FOR STABILITY.
JACKING SYSTEMS	DYNAMIC GUIDANCE SYSTEM THAT CAN BE USED TO EQUALIZE FORCES.	REQUIRES A CONTROL SYSTEM, AND IS MORE EXPENSIVE THAN STATIC SYSTEMS.	SPOTTER JACKS CAN BE USED FOR ADJUSTABLE STATION KEEPING WITH ADEQUATE REACTION POINTS.	NORMALLY EXPENSIVE TO RESIST LARGE FORCES AND HAS LIMITED TRAVEL.	SPOTTER JACKS CAN BE USED TO AID STABILITY.	NOT NORMALLY USED FOR STABILITY.
MULTI-STEPPED GUIDES	HIGHLY EFFECTIVE METHOD TO GRADUALLY GUIDE LARGE OBJECTS INTO POSITION.	REQUIRES CAREFUL PRE-POSITIONING AND TOLERANCE CONTROL.	CAN BE USED FOR STATION KEEPING IMMEDIATELY BEFORE SET-DOWN.	SELDOMLY USED FOR STATION KEEPING, EXCEPT IMMEDIATELY BEFORE INSTALLATION.	COULD BE USED IN COMBINA-TION WITH OTHER SYSTEMS FOR STABILITY.	NOT NORMALLY USED FOR STABILITY.
MOORING-LINE SYSTEMS	CAN BE USED FOR GUIDANCE FOR OBJECT NOT REQUIRING TIGHT TOLERANCES.	POOR TOLERANCE CONTROL COMPARED TO OTHER GUIDANCE SYSTEMS.	COMMONLY USED METHOD FOR STATION KEEPING.	MOORING LINES MAY NOT BE TAUT.	MOORING LINE CAN BE USED TO MAINTAIN STABILITY DURING INSTALLATION BUT MUST BE CHECKED FOR ADEQUATE CAPACITY.	NORMALLY ONLY USED TO SUPPLEMENT OTHER MEANS OF MAINTAINING STABILITY.

(CONTINUED)

MATRIX E-5 (CONCLUDED)

	GUIDANCE SYSTEMS		STATION KEEPING SYSTEMS		STABILITY	
ITEM	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
SPUD-PILES AND DOLPHINS	COMMON, EFFECTIVE, AND ECONOMICAL METHODS FOR PROVIDING GUIDANCE.	USE OF SPUD-PILES ARE DEPENDENT ON THE EQUIPMENT USED, WHILE DOLPHINS REQUIRE PREPLANNING AND EXPENSE.	COMMONLY USED FOR STATION KEEPING. CAN BE COST EFFECTIVE AND EFFICIENT DEPENDING ON LOGISTICS.	DOLPHINS CAN PRESENT OBSTRUC-TIONS, AND SPUD-PILES CAN DISRUPT RIVER BOTTOM.	SPUD-PILES AND DOLPHINS CAN BE USED TO INCREASE STABILITY DURING INSTALLATION.	CAPACITY CHECKS MUST BE MADE, AND THE EXPENSE MAY BE HIGH COM-PARED TO OTHER MEANS OF PROVID-ING STABILITY.
VERTICAL TENSION LINES	CAN BE USED TO GUIDE OBJECTS INTO PLACE IN ONE, OR TWO DIRECTIONS.	THE LINES CAN GET IN THE WAY, AND THEY REQUIRE REACTION POINTS.	CAN BE USED FOR STATION KEEPING AND CAN PROVIDE GREATER TOLERANCE CONTROL THAN MOORING-LINES.	MORE EXPENSIVE AND REQUIRE MORE PLANNING THAN MOORING-LINES.	CAN BE USED TO PROVIDE STABILITY AND CAN BE USED TO PULL DOWN OBJECTS.	CAN BE MORE EXPENSIVE AND REQUIRE MORE PLANNING THAN OTHER MEANS OF PROVIDING STABILITY.
TUG/HELPER BOATS	CAN BE USED FOR GUIDANCE IF OTHER MEANS ARE NOT PRACTICABLE.	LESS RELIABLE THAN OTHER GUID-ANCE METHODS AND DEPENDENT ON OPERATOR SKILL.	COMMONLY USED FOR STATION KEEPING. READILY AVAILABLE AND COST EFFECTIVE.	LESS RELIABLE THAN OTHER METHODS OF STATION KEEPING AND DEPENDENT ON OPERATOR SKILL.	CAN BE ATTENDED IF NO OTHER MEANS ARE AVAILABLE.	NOT NORMALLY USED TO PROVIDE STABILITY.
DIFFERENTIAL BALLASTING	CAN BE USED FOR POSITIONING ADJUSTMENT PRIOR TO INSTALLATION.	NOT NORMALLY CONSIDERED AS A GUIDANCE SYSTEM.	BALLASTING-DOWN USED IN SEMI-SUBMERSIBLES TO REDUCE EXPOSURE TO WAVES.	NOT NORMALLY USED FOR STATION KEEPING AGAINST CURRENTS.	COMMONLY USED TO MAIN-TAIN STABILITY. COST EFFECTIVE AND EFFICIENT.	EXPENSE OF BALLASTING SYSTEM, AND PREPLANNING REQUIRED.
DYNAMIC FEEDBACK	CAN BE USED FOR POSITIONING CONTROL.	EXPENSIVE COM-PARED TO OTHER GUIDANCE SYSTEMS.	CAN BE USED FOR STATION KEEPING.	GENERALLY EXPEN-SIVE COMPARED TO OTHER MEANS.	CAN BE USED TO IMPROVE STABILITY.	GENERALLY EXPEN-SIVE COMPARED TO OTHER MEANS.
REFERENCE FRAMES	WIDELY USED. VERSATILE. EFFECTIVE. CAN BE COST EFFICIENT IF REUSED SUFFICIENTLY.	MAY BE EXPENSIVE UNLESS RE-USED SUFFICIENTLY. REQUIRES PRE-PLANNING.	CAN BE USED AS REACTION FRAMES TOGETHER WITH LINES AND/OR JACKS.	OTHER MEANS MAY BE MORE COST EFFECTIVE.	CAN BE USED AS EFFECTIVE REACTION FRAMES FOR MAINTAINING STABILITY.	MAY BE MORE EXPENSIVE THAN OTHER MEANS OF PROVIDING STABILITY.
UNDER-PRESSURE	CAN BE USED TO MOVE OBJECTS LATERALLY (E.G., IMMERSED TUBES) OR DOWNWARD (E.G. SUCTION ANCHORS/ SKIRTS)	LIMITED APPLICATION.	CAN BE USED WITH SUCTION ANCHORS.	LIMITED APPLICATION.	COULD BE USED TOGETHER WITH OTHER SYSTEMS.	NOT NORMALLY USED TO MAINTAIN STABILITY.

MATRIX E-6 CONNECTION EVALUATION MATRIX						
	FOUNDATION		STRUCTURAL		OPERATIONAL	
ITEM	**FLOAT-IN**	**LIFT-IN**	**FLOAT-IN**	**LIFT-IN**	**FLOAT-IN**	**LIFT-IN**
USING TREMIE CONCRETE	USE OF BASE SLAB REQUIRES EITHER GROUT OR A THICK TREMIE UNDER-BASE PLACEMENT	LACK OF BASE SLAB SIMPLIFIES TREMIE CONNECTION	USE OF SIDEWALLS ON FLOAT-IN UNITS MAY COMPLICATE TREMIE CONCRETE CONNECTIONS WHICH MAY REQUIRE GROUT.	LACK OF PRECAST SHELL WALL BETWEEN PRE-VIOUSLY PLACED AND NEW SHELL SIMPLIFIES CONNECTION	LARGER UNITS HAVE FEWER CONSTRUCTION JOINTS.	MULTIPLE LIFT-IN UNIT CAN LEAD TO OPTIMIZATION OF EQUIPMENT AND PROCEDURES RESULT-ING IN FEWER FLAWS.
USING GROUT	TYPICALLY USED BENEATH BASE SLAB.	NOT COMMONLY USED.	COMMONLY USED.	MAY BE USED.	LARGE AREAS FOR GROUTING MAY REQUIRE SPECIAL PROCEDURES AND MAY REQUIRE AN EXTENDED PERIOD OF TIME TO INSTALL.	MULTIPLE LIFT-IN UNITS PRESENT OPPORTUNITY TO OPTIMIZE ANY USE OF GROUT OVER SMALLER AREAS.
GRAVITY CONNECTIONS	USE SELF-PENETRATING BOTTOMS THAT CAN PASS THROUGH SOFT FOUNDATIONS TO REACH SOUND LAYER.	EXCAVATING THOUGH OPEN BOTTOMED SHELLS CAN SINK THEM DOWN TO SOUND FOUNDING LAYER.	NOT COMMONLY USED.	NOT COMMONLY USED.	NOT COMMONLY USED.	NOT COMMONLY USED.
CONNECTIONS TO FLOATING STRUCTURES	CONNECTION TO FLOATING APPROACH WALLS MAY REQUIRE DRILLED SHAFTS.	CONNECTION TO FLOATING APPROACH WALLS MAY REQUIRE DRILLED SHAFTS.	CONNECTION TO FLOATING APPROACH WALLS MAY REQUIRE THE USE OF SHEAR KEYS ON THE STRUCTURE.	CONNECTION TO FLOATING APPROACH WALLS MAY REQUIRE THE USE OF SHEAR KEYS ON THE STRUCTURE.	MAINTAINING VERTICAL ALIGN-MENT OF MULTI-PLE CONNECTIONS MAY REQUIRE THE USE OF SECOND-ARY, GROUTED, JACKETS.	MAINTAINING VERTICAL ALIGN-MENT OF MULTIPLE CONNECTIONS MAY REQUIRE THE USE OF SECONDARY, GROUTED, JACKETS.
CONNECTIONS AT EXPANSION JOINTS	NOT COMMONLY USED.	NOT COMMONLY USED.	REQUIRES SOME EXTRA DETAILING AND INSTALLING SEQUENCING.	USE OF SHEAR KEYS, BETWEEN MONO-LITHS IS SIMPLIFIED BY USE OF TREMIE CONCRETE CONNECTION.	MAY REQUIRE THAT USE OF COMPRESSION SEALS AS OPPOSED TO WATERSTOPS.	MAY REQUIRE THAT USE OF COMPRESSION SEALS AS OPPOSED TO WATERSTOPS.
(CONTINUED)						

MATRIX E-6 (CONCLUDED)

ITEM	FOUNDATION		STRUCTURAL		OPERATIONAL	
	FLOAT-IN	LIFT-IN	FLOAT-IN	LIFT-IN	FLOAT-IN	LIFT-IN
CONNECTIONS TO EXISTING STRUCTURES	UNDERWATER CONNECTION TO EXISTING STRUC-TURES MAY BE FACILITATED BY THE USE OF WIRE SAW CUTTING, LINE DRILLING, OR CONTROLLED BLASTING.	UNDERWATER CONNECTION TO EXISTING STRUC-TURES MAY BE FACILITATED BY THE USE OF WIRE SAW CUTTING, OR CONTROLLED BLASTING.	UNDERWATER CONNECTION TO EXISTING STRUCTURES MAY BE FACILITATED BY THE USE OF WIRE SAW CUTTING, OR CONTROLLED BLASTING.	UNDERWATER CONNECTION TO EXISTING STRUCTURES MAY BE FACILITATED BY THE USE OF WIRE SAW CUTTING, OR CONTROLLED BLASTING.	UNDERWATER CONNECTION TO EXISTING STRUCTURES MAY BE FACILI-TATED BY THE USE OF WIRE SAW CUTTING, OR CONTROLLED BLASTING.	UNDERWATER CONNECTION TO EXISTING STRUC-TURES MAY BE FACILITATED BY THE USE OF WIRE SAW CUTTING, OR CONTROLLED BLASTING.
CONNECTIONS AT ISOLATION JOINTS	FLEXIBLE CUT-OFF WALL DETAILS ARE REQUIRED.	FLEXIBLE CUT-OFF WALL DETAILS ARE REQUIRED.	TYPICALLY CONSISTS OF A GAP WITH FLEXIBLE FLOW BARRIER.	TYPICALLY CONSISTS OF A GAP WITH FLEXIBLE FLOW BARRIER.	ATTENTION TO DETAILING IS IMPORTANT.	ATTENTION TO DETAILING IS IMPORTANT.
CONNECTIONS AT CONSTRUC-TION JOINTS	FEWER JOINTS SIMPLIFIES THE PROBLEM OF TREMIE AND GROUT CONTAIN-MENT AT JOINTS.	CONTAINMENT OF TREMIE CONCRETE AND GROUT AT JOINTS REQUIRES EXTRA DETAILING.	FEWER JOINTS SIMPLIFIES THE PROBLEM OF TREMIE AND GROUT CONTAINMENT AT JOINTS.	CONTAINMENT OF TREMIE CONCRETE AND GROUT AT JOINTS REQUIRES EXTRA DETAILING.	FEWER JOINTS SIMPLIFIES THE PROBLEM OF TREMIE AND GROUT CONTAIN-MENT AT JOINTS.	CONTAINMENT OF TREMIE CONCRETE AND GROUT AT JOINTS REQUIRES EXTRA DETAILING.
CONNECTIONS MADE IN THE PREFABRICA-TION FACILITY	PROVISIONS FOR FOUNDATION CONNECTIONS MAY REQUIRE MORE ALLOW-ANCE THAN FOR LIFT-IN.	PROVISIONS FOR FOUNDATION CON-NECTIONS MAY REQUIRE LESS ALLOWANCE THAN FOR FLOAT-IN.	LARGER UNITS FACILITATE MORE PREFABRICATED CONNECTIONS.	MORE CONNECTIONS MUST BE MADE IN THE FIELD AS COM-PARED TO FLOAT-IN.	FEWER CON-STRUCTION JOINTS COMPARED TO LIFT-IN.	MORE CONSTRUC-TION JOINTS COMPARED TO FLOAT-IN.
MECHANICAL CONNECTIONS	TYPICALLY DOES NOT APPLY.	TYPICALLY DOES NOT APPLY.	IN SOME CASES THE COMPLETED GATES CAN BE CARRIED IN WITH THE FLOAT-IN SHELL.	SMALL GATES CAN BE PRE-INSTALLED. LARGE GATES CAN BE PREASSEMBLED AND INSTALLED SEPARATELY.	TYPICALLY FINAL CONNECTIONS WOULD BE MADE IN-THE-DRY.	TYPICALLY FINAL CONNECTIONS WOULD BE MADE IN-THE-DRY.
ELECTRICAL CONNECTIONS	FOUNDATION INSTRUMENTA-TION CAN BE DRILLED IN, WITH LEAD CON-NECTIONS MADE ABOVE WATER.	FOUNDATION INSTRUMENTATION CAN BE DRILLED IN, WITH LEAD CONNECTIONS MADE ABOVE WATER.	SLOTS AND BLOCKOUTS CAN BE PROVIDED AND CONNECTIONS TYPICALLY MADE IN-THE-DRY.	SLOTS AND BLOCK-OUTS CAN BE PROVIDED AND CONNECTIONS TYPICALLY MADE IN-THE-DRY.	FLOAT-IN UNITS WILL TYPICALLY HAVE FEWER CONSTRUCTION JOINTS FOR ELECTRICAL CABLES TO PASS.	LIFT-IN UNITS WILL TYPICALLY HAVE MORE CONSTRUCTION JOINTS FOR ELECTRICAL CABLES TO PASS.

MATRIX E-7 REPRESENTATIVE TOLERANCE/ALLOWABLES EVALUATION MATRIX

	ORESUND IMMERSED TUBE		BRADDOCK DAM		OLMSTED DAM	
ITEM	**SPECIFIED**	**ACHIEVED**	**SPECIFIED**	**ACHIEVED**	**SPECIFIED**	**ACHIEVED**
PILE POSITIONING	N. A.	N.A.	HORIZ. +/- 2" VERT. +/- 1/2"	------	HORIZ. +/- 3" VERT. +/- 2"	------
SCREEDING	+/- 2"	+/- 1"	+/- 3"	------	+/- 4"	------
EXCAVATION	+/- 20"	+/- 20"	+/- 12"	------	+/- 12"	------
WATER CUT-OFF SYSTEM	N.A.	N.A.	HORIZ. +/- 6" VERT. +/- 6"	------	HORIZ. +/- 3" VERT. +/- 2"	------
SCOUR PROTECTION	+/- 10"	+/- 10"	N.A.	------	N. A.	------
WEIGHT GROWTH	+/- 2.75%	+/- 2.75%	+/- 3%	------	+/- 5%	------
ALLOWABLE CURRENTS	3 FT/SEC	3 FT/SEC	3 FT/SEC	------	6 FT/SEC	------
POSITIONING: PRECAST UNITS	HORIZ. +/- 4" VERT. +/- 2"	HORIZ. +/- 4" VERT. +/- 2"	HORIZ. +/- 2" VERT. +/- 1/4"	------	HORIZ. +/- 1" VERT. +/- 1/2"	------

MATRIX S-1 CONSTRUCTION METHOD SELECTION MATRIX

ITEM	FLOAT-IN OPTION		HEAVY-LIFT OPTION		LIGHT-LIFT OPTION	
	ADVANTAGE	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
SAFETY	FEWER OPERA-TIONS. FASTER INSTALLATION.	RISK OF LOSING LARGE UNIT. ATTRACTS LARGE HYDRAULIC FORCES.	CONTROL OFFERED BY CERTIFIED CRANE BARGE WITH FEWER LIFTS.	MORE DIVER OPERATIONS THAN FLOAT-IN.	HANDLING OF SMALLER UNITS AND WORKER FAMILIARITY WITH EQUIPMENT.	MORE NUMEROUS OPERATIONS WITH MORE TIME SPENT IN THE RIVER.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
IMPACT ON NAVIGATION	LEAST TIME SPENT IN THE RIVER WITH LEAST EXPOSURE TIME TO IMPACT.	RISK OF IMPACT DURING: 1. TOW, 2. STORAGE, 3. INSTAL-LATION. FOR BOTH MOORING LINES AND LARGE UNITS.	INTERMEDIATE AMOUNT TIME SPENT AFLOAT NEAR NAVIGATION.	INTERMEDIATE IMPACT ON NAVIGATION AND INFLUENCE OF MOORING LINES.	HANDLING OF RELATIVELY SMALL UNITS	GREATEST AMOUNT OF TIME INFLUENC-ING TRAFFIC WITH GREATEST RISK OF IMPACT.
WEIGHTED VALUE (ADJ. X VAL.)						
RISK OF ATTAINING TOLERANCE	POTENTIAL OPTION OF INSTALLING GATES AND EQUIPMENT IN PREFAB. FACILITY.	FREQUENTLY REQUIRES THE USE OF PRESTRESSING AND THIN WALLS RESULTING IN DURABILITY RISKS.	INTERMEDIATE NUMBER OF JOINTS, AND WALL THICKNESS CAN BE INCREASED.	REQUIRES INSTALL-ING LARGE GATES (TAINTER, MITER, ETC.) IN A CON-FINED SPACE BETWEEN BULKHEADS.	HANDLING OF RELATIVELY SMALL UNITS.	LARGEST NUMBER OF JOINTS, AND TYPICALY REQUIRES GATE INSTALLATION IN THE FIELD.
WEIGHTED VALUE (ADJ. X VAL.)						
INSTALLATION RISK	REDUCED NUMBER OF, AND TOTAL DURATION OF, INSTALLATIONS	LARGE FORCES TO HANDLE DURING INSTALLATION.	USE OF LARGE EQUIPMENT WITH GOOD CONTROL. WEIGHT RESISTS CURRENT FORCES.	HANDLING OF HEAVY UNITS REQUIRES PLANNING AND MOBILIZTION OF LARGE EQUIPMENT.	SMALLER UNITS MAY BE EASIER TO HANDLE WITH REDUCED FORCES.	SMALL UNITS HAVE REDUCED WEIGHT TO RESIST CURRENT FORCES, AND NUM-BER OF OPERATIONS.

NOTES:
1. VALUE EXPRESSED AS A MONETARY QUANTITY RELATIVE TO A SELECTED STANDARD OF COMPARISON, WITH POSITIVE VALUES EXPRESSING BENEFITS AND NEGATIVE VALUES EXPRESSING COSTS.
2. THE ADJUSTMENT FACTOR IS INTENDED (A) TO CORRECT FOR THE PROBABILITY OF OCCURRENCE OF A VALUE, (B) THE TIME VALUE OF MONEY, AND (C) RISK AVERSION TO MAJOR FAILURE OR LOSS OF LIFE.

(CONTINUED)

MATRIX S-1 (CONCLUDED)						
	FLOAT-IN OPTION		HEAVY-LIFT OPTION		LIGHT-LIFT OPTION	
ITEM	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
WEIGHTED VALUE (ADJ. X VAL.)						
SCHEDULE RELIABILITY	MINIMIZES EXPOSURE TIME TO RIVER CONDITIONS	RISK OF MAINTAIN-ING LARGE PREPARED FOUNDATION. RISK OF SINKING.	USE OF LARGE CERTIFIED VESSELS RESULTS IN GOOD CONTROL.	TYPICALLY, MORE TIME SPENT EXPOSED TO RIVER CONDITIONS THAN FOR FLOAT-IN	USE OF FAMILIAR CERTIFIED EQUIPMENT ON HIGHLY REPETITIVE OPERATIONS	MOST TIME SPENT WORKING IN THE RIVER WITH RISK OF TOLERANCE ERRORS REQUIRING CORRECTION.
WEIGHTED VALUE (ADJ. X VAL.)						
SUMMATION OF VALUE						

MATRIX S-2 CONSTRUCTION METHOD SELECTION MATRIX

	FLOAT-IN OPTION		HEAVY-LIFT OPTION		LIGHT-LIFT OPTION	
ITEM	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
RISK OF CLAIMS	REDUCE TIME SPENT EXPOSED TO RIVER CONDITIONS.	RISK AVERSION ASSOCIATED WITH POTENTIAL LOSS OF LARGE UNIT.	REDUCED CONSEQUENCE ASSOCIATED WITH THE LOSS OF A SINGLE UNIT.	EXPENSIVE EQUIPMENT USED, AND MORE TIME SPENT IN THE RIVER THAN FLOAT-IN.	SIGNIFICANTLY REDUCED CONSEQUENCE ASSOCIATED WITH THE LOSS OF A SINGLE UNIT.	INCREASED NUMBER OF OPERATIONS, AND JOINTS.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
PROVEN TRACK RECORD	NUMEROUS FLOAT-IN PROJECTS: OFFSHORE; IMMERSED TUBES; BRIDGE PIERS; ETC.	SOME LOST PROJECTS	NUMEROUS PARTIALLY BUOYANT PROJECTS FOR: BRIDGE PIERS, IMMERSED TUBES; AND STORM SURGE BARRIERS.	SOME UNITS PLACED SOMEWHAT OUT OF POSITION.	COMMON-TECHNOLOGY, FREQUENTLY USED.	SUCCESS HIGHLY DEPENDENT ON CONTRACTOR SKILL. SEVERAL FAILURES.
WEIGHTED VALUE (ADJ. X VAL.)						
AVAILABILITY OF EQUIPMENT	REQUIRES MINIMAL USE OF EQUIPMENT.	DRAFT LIMITATIONS MAY REQUIRE MULTIPLE STEPS USING DIFFERENT EQUIPMENT.	SOME TYPES OF HEAVY-LIFT EQUIPMENT CAN READILY BE ASSEMBLED.	LARGE EQUIPMENT IS NOT READILY AVAILABLE.	EQUIPMENT COMMONLY AVAILABLE.	EQUIPMENT NOT ALWAYS WELL MAINTAINED.
WEIGHTED VALUE (ADJ. X VAL.)						
AVAILABILITY OF PREFAB. FACILITIES	FABRICATION ON A BARGE IS TYPICALLY AVAILABLE UPON SHORT NOTICE.	LIMITED SELECTION OF EXISTING SITES WITH LONG LEAD TIMES ON NEW SITES.	MORE FABRICATION OPTIONS ARE AVAILABLE THAN FOR FLOAT-IN METHODS.	POTENTIAL EPA AND CULTURAL STUDIES IMPACT ON NEW SITES.	EXISTING SITES ARE TYPICALLY AVAILABLE.	EXISTING SITES TYPICALLY PLACE LIMITS ON UNIT SIZES AND SHAPES.

NOTES:
1. VALUE EXPRESSED AS A MONETARY QUANTITY RELATIVE TO A SELECTED STANDARD OF COMPARISON, WITH POSITIVE VALUES EXPRESSING BENEFITS AND NEGATIVE VALUES EXPRESSING COSTS.
2. THE ADJUSTMENT FACTOR IS INTENDED (A) TO CORRECT FOR THE PROBABILITY OF OCCURRENCE OF VALUE, (B) TO CORRECT FOR THE TIME VALUE OF MONEY, AND (C) TO ACCOUNT FOR RISK AVERSION TO MAJOR FAILURE OR LOSS OF LIFE.

(CONTINUED)

MATRIX S-2 (CONCLUDED)						
	FLOAT-IN OPTION		HEAVY-LIFT OPTION		LIGHT-LIFT OPTION	
ITEM	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
WEIGHTED VALUE (ADJ. X VAL.)						
QUALIFIED CONTRACTORS	NUMEROUS QUALIFIED CONTRACTORS.	EXISTING FABRICATION FACILITIES GIVE SOME CONTRACTORS AN ADVANTAGE.	LIMITS SELECTION OF CONTRACTORS TO THE FEW MOST QUALIFIED.	EXISTING EQUIPMENT GIVES SOME CONTRACTORS AN ADVANTAGE.	NUMEROUS CONTRACTORS AVAILABLE.	OPENS COMPETITION TO RISKIER CONTRACTORS.
WEIGHTED VALUE (ADJ. X VAL.)						
SUMMATION OF VALUE						

MATRIX S-3 PREFABRICATION FACILITIES SELECTION MATRIX

ITEM	SITING OPTIONS		LOAD-OUT SYSTEMS		IN-FACILITY TRANSPORT	
	ADVANTAGE	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
GRAVING DOCK	SOME EXISTING SITES ARE AVAILABLE.	DEVELOPMENT OF NEW SITES MAY EXPOSE CORPS TO EPA AND CULTURAL STUDIES IMPACTS.	FLOAT-OUT IS A SIMPLE AND A WELL-UNDERSTOOD, TECHNOLOGY.	REMOVAL OF EXISTING GATE CAN BE A COMPLICATION AND AN EXPENSE.	OVERHEAD GANTRY CRANES MAY BE AVAILABLE AT SOME SITES.	WORKING IN A HOLE MAKES ACCESS MORE DIFFICULT.
WEIGHTED VALUE (ADJ[2]. X VAL[1])						
PRECAST YARD	SEVERAL EXISTING SITES ARE AVAILABLE.	DEVELOPMENT OF NEW SITES MAY EXPOSE CORPS TO EPA AND CULTURAL STUDIES IMPACTS.	SKID-WAYS, OR LIFT-OFF OF BULKHEAD ARE PROVEN PRACTICAL METHODS.	EXPENSE OF LOAD-OUT SYSTEM.	NUMEROUS OPTIONS AVAILABLE SUCH AS: SKIDDING, JACKS, CRAWLERS, AIR-LIFT, ROLLERS, ETC.	NEED TO SUPPORT FREQUENTLY UNUSUAL SHAPES WHILE TRANSPORTING IN-FACILITY.
WEIGHTED VALUE (ADJ[2]. X VAL[1])						
FABRICATE ON BARGE	NO EXPOSURE TO EPA OR CULTURAL STUDIES IMPACT.	SIZE LIMITATIONS.	NUMEROUS OPTIONS SUCH AS: LAUNCH FROM TILTING BARGE; SINKING BARGE; USE OF A LOCK; USE OF A SKIDWAY AND CRADLE; USE OF A CRANE; ETC.	NEED TO GET UNITS OF BARGES ENTAILS EXTRA EXPENSE.	TYPICALLY THE UNITS ARE NOT MOVED AROUND ON THE BARGE, BUT RATHER THE BARGE IS MOVED WITH THE UNIT. SKIDDING ON AND OFF THE BARGE IS POSSIBLE.	SPACE LIMITATION ON BARGE DECK. LOAD LIMITATIONS ON BARGE DECK.
WEIGHTED VALUE (ADJ[2]. X VAL[1])						
SHIPYARD	SEVERAL SHIP-YARDS EXIST ON THE INLAND WATERWAYS.	SHIPYARDS TYPIC-ALLY GIVE PRIORITY TO SHIP BUILDING, AND THUS MAY NOT BE AVAILABLE.	LAUNCH WAYS TYPICALLY ALREADY EXIST.	SOME STRUCTURES MAY REQUIRE STRENGTHENING FOR LAUNCH.	EXISTING.	MAY REQUIRE MODIFICATION FOR CONCRETE STRUCTURES.

NOTES:
1. VALUE EXPRESSED AS A MONETARY QUANTITY RELATIVE TO A SELECTED STANDARD OF COMPARISON, WITH POSITIVE VALUES EXPRESSING BENEFITS AND NEGATIVE VALUES EXPRESSING COSTS.
2. THE ADJUSTMENT FACTOR IS INTENDED (A) TO CORRECT FOR THE PROBABILITY OF OCCURRENCE OF A VALUE, (B) TO CORRECT FOR THE TIME VALUE OF MONEY, AND (C) TO ACCOUNT FOR RISK AVERSION TO MAJOR FAILURE OR LOSS OF LIFE.

(CONTINUED)

MATRIX S-3 (CONCLUDED)						
	SITING OPTIONS		LOAD-OUT SYSTEMS		IN-FACILITY TRANSPORT	
ITEM	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
WEIGHTED VALUE (ADJ[2]. X VAL[1])						
MULTILEVEL FACILITY	VERSATILE SYSTEM THAT CAN COMBINE SKIDWAYS AND GRAVING DOCKS.	EXPENSIVE AND REQUIRES NEW DEVELOPMENT WITH EPA AND CULTURAL IMPACT POTENTIAL.	SEE GRAVING DOCKS.	SEE GRAVING DOCKS.	SEE PRECAST YARD AND GRAVING DOCKS.	SEE PRECAST YARD AND GRAVING DOCKS.
WEIGHTED VALUE (ADJ[2]. X VAL[1])						
SUMMATION OF VALUE						

MATRIX S-4 PREPRATORY WORK EVALUATION MATRIX

ITEM	FLOAT-IN METHOD		HEAVY-LIFT-IN METHOD		LIGHT-LIFT-IN METHOD	
	ADVANTAGE	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
TIE-IN TO EXISTING STRUCTURES	SPEED OF CONNECTION TO EXISTING STRUCTURES.	MAY REQUIRE RELAXED TOLERANCES FOR CONNECTION.	PRECISION OF LARGE HANDLING EQUIPMENT.	MAY REQUIRE ADEQUATE SPACE FOR HANDLING EQUIPMENT	SMALLER UNITS CAN BE POSITIONED ACCURATELY.	MAY REQUIRE EXTRA TIME TO COMPLETE CONNECTION.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
NAVIGATION CONTROL	SPEED OF INSTALLATION MAY MINIMIZE CONTROL REQUIREMENTS	MAY REQUIRE CONTROL FOR BOTH TOW AND INSTALLATION.	QUICK DEPLOYMENT AND QUICK WITHDRAWAL MAY MINIMIZE NAVIGATION CONTROL.		QUICK DEPLOY-MENT AND QUICK WITHDRAWAL MAY MINIMIZE NAVIGATION CONTROL.	SMALL UNIT SUBJECT TO IMPACT DAMAGE, AND EXTRA TIME REQUIRED FOR INSTALLATION.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
OFFSITE STAGING AREAS	SOME PRE-EXISTING GRAVING DOCKS, LAUNCH WAYS, OR SHIPYARDS MAY BE AVAILABLE.	NEW SITES MAY REQUIRE EPA AND CULTURAL STUDIES APPROVAL.	SOME PRE-EXISTING SKIDWAYS, PIERS, BULKHEAD WALLS, ETC. MAY BE AVAILABLE.	NEW SITES MAY REQUIRE EPA AND CULTURAL STUDIES APPROVAL.	PRE-EXISTING SITES ARE MORE LIKELY TO BE AVAILABLE THAN FOR HEAVY-LIFT OR FLOAT-IN OPTIONS.	UNITS SUITABLE FOR FABRICATION IN EXISTING FACILITIES MAY NOT BE OPTIONAL FOR CONSTRUCTION PLAN.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
SURVEY CONTROLS	PRE-ESTABLISHED SURVEY SYSTEM CAN TYPICALLY CONTROL POSITIONING TO +/- 2 IN.	PREPLANNING AND EXPENSE OF QUALITY SURVEY SYSTEMS.	PRE-ESTABLISHED SURVEY SYSTEM CAN TYPICALLY CONTROL POSITIONING TO +/- 1.5 IN.	PREPLANNING AND EXPENSE OF QUALITY SURVEY SYSTEMS.	PRE-ESTABLISHED SURVEY SYSTEM CAN TYPICALLY CONTROL POSITIONING TO +/- 1 IN.	PREPLANNING AND EXPENSE OF QUALITY SURVEY SYSTEMS.

NOTES:
1. VALUE EXPRESSED AS A MONETARY QUANTITY RELATIVE TO A SELECTED STANDARD OF COMPARISON, WITH POSITIVE VALUES EXPRESSING BENEFITS AND NEGATIVE VALUES EXPRESSING COSTS.
2. THE ADJUSTMENT FACTOR IS INTENDED (A) TO CORRECT FOR THE PROBABILITY OF OCCURRENCE OF A VALUE, (B) TO CORRECT FOR THE TIME VALUE OF MONEY, AND (C) TO ACCOUNT FOR RISK AVERSION TO MAJOR FAILURE OR LOSS OF LIFE.

(CONTINUED)

MATRIX S-4 (CONCLUDED)

ITEM	FLOAT-IN METHOD		HEAVY-LIFT-IN METHOD		LIGHT-LIFT-IN METHOD	
	ADVANTAGE	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
STATION KEEPING SYSTEMS	MOORING LINES, VERTICAL TENSION LINES, OR DOLPHINS CAN BE USED EFFECTIVELY FOR STATION KEEPING.	TYPICALLY LARGER AND MORE COSTLY STATION KEEPING SYSTEMS ARE REQUIRED THAN FOR LIFT-IN OPTIONS.	MOORING LINES, SPUD-PILES, VERTICAL TENSION LINES, AND JACKS CAN BE USED EFFECTIVELY.	EXPENSE AND PREPLANNING OF SYSTEMS.	MOORING LINES, SPUD-PILES, REACTION FRAMES, AND JACKS CAN BE USED EFFECTIVELY.	SMALLER UNITS MAY REQUIRE MORE POSITIVE SYSTEMS TO RESIST CURRENT FORCES.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
SUMMATION OF VALUE						

MATRIX S-5 PRECAST CONCRETE UNIT SELECTION MATRIX						
	FLOAT-IN METHOD		HEAVY-LIFT-IN METHOD		LIGHT-LIFT-IN METHOD	
ITEM	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
WALL THICKNESS	FLOATABLE WALL THICKNESSES ARE ACCEPTABLE	MAXIMUM WALL THICKNESS IS TYPICALLY LIMITED BY DRAFT LIMITATIONS.	WALL THICKNESSES CAN TYPICALLY BE GREATER THAN FLOAT-IN	GREATER WALL THICKNESSES INCREASE EQUIP-MENT COST AND REQUIREMENTS.	WALL THICKNESSES CAN TYPICALLY BE GREATER THAN FLOAT-IN	WALL THICKNESS MAY BE LIMITED BY LIFTING EQUIPMENT CAPACITY.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
COMPOSITE ACTION	COMPOSITE ACTION CAN REDUCE REIN-FORCING STEEL REQUIREMENTS	COMPOSITE ACTION CAN INCREASE DETAILING REQUIREMENTS	COMPOSITE ACTION CAN REDUCE REINFORCING STEEL REQUIREMENTS	COMPOSITE ACTION CAN INCREASE DETAILING REQUIREMENTS	COMPOSITE ACTION CAN REDUCE REIN-FORCING STEEL REQUIREMENTS	COMPOSITE ACTION CAN INCREASE DETAILING REQUIREMENTS
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
MATERIAL	POTENTIAL ADVANTAGE IN USING PRESTRESSING STEEL.	USE OF LIGHTWEIGHT CONCRETE MAY BE REQUIRED FOR DRAFT CONSIDERATIONS. POTENTIAL CORROSION OF PRESTRESSING STEEL.	REDUCED, OR NO NEED FOR PRESTRESSING STEEL.	INTERMEDIATE NEED FOR JOINT-FILLING MATERIAL.	FAMILIAR TECHNOLOGY TO MANY CONTRACTORS.	POTENTIAL REQUIREMENT FOR EXCESSIVE AMOUNTS OF JOINT FILLING MATERIAL.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
CONCRETE COVER	HIGH PERFORMANCE PRECAST CONCRETE CAN BE USED TO REDUCE COVER REQUIREMENT IN SOME CASES.	CONCRETE COVER REQUIREMENT CAN ADVERSELY AFFECT DRAFT, AND MAY REQUIRE SECONDARY REINFORCING MESH IN THE COVER FOR CRACK CONTROL.	HIGH PERFORMANCE PRECAST CONCRETE CAN BE USED TO REDUCE COVER REQUIREMENT IN SOME CASES.	CONCRETE COVER REQUIREMENT MAY REQUIRE SECONDARY REINFORCING MESH IN THE COVER FOR CRACK CONTROL.	HIGH PERFORMANCE PRECAST CONCRETE CAN BE USED TO REDUCE COVER REQUIREMENT IN SOME CASES.	CONCRETE COVER REQUIREMENT MAY REQUIRE SECONDARY REINFORCING MESH IN THE COVER FOR CRACK CONTROL.

NOTES:
1. VALUE EXPRESSED AS A MONETARY QUANTITY RELATIVE TO A SELECTED STANDARD OF COMPARISON, WITH POSITIVE VALUES EXPRESSING BENEFITS AND NEGATIVE VALUES EXPRESSING COSTS.
2. THE ADJUSTMENT FACTOR IS INTENDED (A) TO CORRECT FOR THE PROBABILITY OF OCCURRENCE OF A VALUE, (B) TO CORRECT FOR THE TIME VALUE OF MONEY, AND (C) TO ACCOUNT FOR RISK AVERSION TO MAJOR FAILURE OR LOSS OF LIFE.

(CONTINUED)

MATRIX S-5 (CONCLUDED)

ITEM	FLOAT-IN METHOD		HEAVY-LIFT-IN METHOD		LIGHT-LIFT-IN METHOD	
	ADVANTAGE	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
CONNECTION - LOAD PATH	FLOAT-IN UNIT INHERENTLY HAS SUBSTANTIAL CAPACITY, THUS LIMITING NEED FOR COMPOSITE ACTION.	NEED FOR WATER-TIGHT BULKHEADS CAN DISRUPT LOAD PATH REQUIRING EXTRA DETAILS.	REDUCED REQUIREMENT FOR INTERNAL WALLS AND/OR BASE SLABS FACILITATES COMPOSITE ACTION.	LACK OF INHERENT STRENGTH IN SHELL PLACES GREATER DEMANDS ON COMPOSITE ACTION.	REDUCED REQUIREMENT FOR INTERNAL WALLS AND/OR BASE SLABS FACILITATES COMPOSITE ACTION.	MULTIPLE JOINTS DISRUPT LOAD PATH.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
SUMMATION OF VALUE						

MATRIX S-6 PREFABRICATION OF MECHANICAL ELEMENTS SELECTION MATRIX

ITEM	FLOAT-IN METHOD		HEAVY-LIFT-IN METHOD		LIGHT-LIFT-IN METHOD	
	ADVANTAGE	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
GATE ASSEMBLY	GATES CAN EITHER BE ASSEMBLED BETWEEN DEWATERED BULKHEAD, OR CAN BE PRE-ASSEMBLED AND CARRIED IN.	ASSEMBLY WORK IN A CONFINED SPACE SUBJECT TO FLOODING, OR REQUIREMENT TO CARRY PRE-ASSEMBLED GATE IN PLACE.	GATES CAN BE PRE-ASSEMBLED ON A BARGE, OR ON SHORE AND CARRIED INTO PLACE.	MAY REQUIRE FINAL INSTALLATION IN A CONFINED SPACE BETWEEN DEWATERED BULKHEADS.	SOME SUB-ASSEMBLY WORK AND BE PREFORMED.	IT MAY BE DIFFICULT/ INEFFICIENT TO ASSEMBLE GATES IN POSITION.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
GATE INSTALLATION	FLOAT-IN UNITS FREQUENTLY HAVE SUFFICIENT CAPACITY TO CARRY-IN PRE-INSTALLED GATES.	PRE-INSTALLED GATES CAN NEGATIVELY AFFECT DRAFT AND STABILITY, AND CAN POSE A LOGISTICS PROBLEM.	PRE-ASSEMBLED GATES CAN FREQUENTLY BE FLOATED OR LIFTED INTO POSITION.	INSTALLATION OF PRE-ASSEMBLED GATES CAN REQUIRE THE USE OF SUPPLEMENTAL BARGES OR CRANES.	SUBASSEMBLIES OF GATES CAN BE LIFTED INTO POSITION.	LESS EFFECTIVE THAN EITHER HEAVY-LIFT, OR FLOAT-IN.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
LIFTING FRAMES	NOT NORMALLY USED.	NORMALLY NOT USED WITH FLOAT-IN.	CAN BE USED TO SUPPLEMENT STRENGTH OF WEAK SHELLS.	REQUIRE MULTIPLE USE TO BE COST EFFECTIVE.	CAN BE USED TO SUPPLEMENT STRENGTH OF WEAK ELEMENTS.	REQUIRE MULTIPLE USE TO BE COST EFFECTIVE.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						

NOTES:
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2. THE ADJUSTMENT FACTOR IS INTENDED (A) TO CORRECT FOR THE PROBABILITY OF OCCURRENCE OF A VALUE, (B) TO CORRECT FOR THE TIME VALUE OF MONEY, AND (C) TO ACCOUNT FOR RISK AVERSION TO MAJOR FAILURE OR LOSS OF LIFE.

(CONTINUED)

MATRIX S-6 (CONCLUDED)						
	FLOAT-IN METHOD		**HEAVY-LIFT-IN METHOD**		**LIGHT-LIFT-IN METHOD**	
ITEM	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
TEMPLATE FRAMES	CAN BE USED TO AID IN POSITIONING.	NOT NORMALLY USED EXCEPT AS DOLPHINS.	CAN BE HANDLED EFFECTIVELY WITH HEAVY-LIFT SYSTEM.	REQUIRES MULTIPLE USE TO BE COST EFFECTIVE.	CAN BE USED EFFECTIVELY TO GUIDE SMALL UNITS.	REQUIRE MULTIPLE USE TO BE COST EFFECTIVE.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
MECHANICAL EQUIPMENT	CAN BE PRE-INSTALLED ON FLOAT-IN UNITS.	DRAFT RESTRICTIONS MAY PROHIBIT THIS OPTION.	CAN BE PRE-INSTALLED ON HEAVY-LIFT UNITS.	HANDLING REQUIREMENTS MAY LIMIT THIS OPTION.	LIGHT-LIFT CRANE CAN BE USED TO INSTALL EQUIPMENT.	DEPENDS ON COMPATIBILITY OF CRANE AND EQUIPMENT.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
SUMMATION OF VALUE						

MATRIX S-7 TRANSPORTATION METHOD SELECTION MATRIX

ITEM	FLOATING		PARTIALLY BUOYANT		LIFT-IN	
	ADVANTAGE	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
SAFETY	FLOAT-IN UNITS CAN BE CARRIED ON BARGES FOR LONG TOWS.	RISK AVERSION MAY REQUIRE DESIGN FOR SEVERE CONDITIONS DURING TOW.	LIFT VESSEL CAN PROVIDE CONTROL, AND IS PRE-CERTIFIED FOR SAFETY.	FOR LONG TOWS, TRANSPORT ON A BARGE MAY BE ADVISABLE. BUOYANCY COULD BE LOST.	A PRECERTIFIED AND POTENTIALLY TRIAL TESTED VESSEL IS USED.	FOR LONG TOWS, TRANSPORT ON A BARGE MAY BE ADVISABLE.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
IMPACT ON NAVIGATION	TRANSPORT MAY BE QUICK TO AVOID INTERFERENCE.	TRANSPORT MAY BE SLOW AND MAY INTERFERE WITH TRAFFIC.	TRANSPORT OF PARTIALLY BUOYANT UNITS IS TYPICALLY OVER SHORT DISTANCES.	TRANSPORT MAY BE SLOW.	UNITS CARRIED IN BY A CRANE ARE NORMALLY TRANSPORTED OVER SHORT DISTANCES.	TRANSPORT MAY BE SLOW.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						
RISK OF ACCIDENT	TIME SPENT IN THE RIVER CAN BE MINIMIZED.	IMPACT WITH BARGE TOWS, OR SINKING IN THE CHANNEL ARE RISKS.	THE LIFT VESSEL CAN REDUCE THE RISK OF ACCIDENTS.	IMPACT WITH BARGE TOWS OR SINKING IN THE CHANNEL ARE RISKS.	THE LIFT VESSEL CAN REDUCE THE RISK OF ACCIDENTS.	RISK OF IMPACT ON THE LIFTING VESSEL.
WEIGHTED VALUE (ADJ[2]. X VAL[1].)						

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2. THE ADJUSTMENT FACTOR IS INTENDED (A) TO CORRECT FOR THE PROBABILITY OF OCCURRENCE OF A VALUE, (B) TO CORRECT FOR THE TIME VALUE OF MONEY, AND (C) TO ACCOUNT FOR RISK AVERSION TO MAJOR FAILURE OR LOSS OF LIFE.

(CONTINUED)

MATRIX S-7 (CONCLUDED)						
	FLOATING		**PARTIALLY BUOYANT**		**LIFT-IN**	
ITEM	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**	**ADVANTAGE**	**DISADVANTAGE**
EXPOSURE TO RIVER CONDITIONS	TIME SPENT IN THE RIVER CAN BE MINIMIZED.	LOW OR HIGH WATER CONDITION CAN POSE TRANSPORT PROBLEMS. AND LOAD-OUT MAY BE A PROBLEM. PREFABRICATION SITE COULD BE SUBJECT TO FLOODING AT HIGH WATER.	PARTIALLY BUOYANT UNITS ARE TYPICALLY LARGE WITH INTERMEDIATE TIME EXPOSED TO RIVER CONDITIONS.	PARTIALLY BUOYANT UNITS ARE TYPICALLY SMALLER THAN FLOAT-IN UNITS AND THUS MAY REQUIRE MORE TIME EXPOSED TO RIVER CONDITIONS.	LIFTING VESSELS REMOVE THE UNITS OUT OF THE RIVER FOR TRANSPORT.	CARRIED IN UNITS ARE TYPICALLY SMALLER THAN EITHER FLOAT-IN OR PARTIALLY BUOYANT, WHICH MAY REQUIRE MORE RIVER EXPOSURE.
WEIGHTED VALUE (ADJ^2. X VAL^1.)						
TRACK RECORD	NUMEROUS FLOAT-IN STRUCTURES HAVE BEEN BUILT SUCCESSFULLY.	A FEW COMPLETE LOSSES HAVE OCCURRED FOR FLOAT-IN STRUCTURES.	NUMEROUS PARTIALLY BUOYANT STRUCTURES HAVE BEEN SUCCESSFULLY INSTALLED.	SOME POSITIONING PROBLEMS HAVE OCCURRED.	NUMEROUS CARRIED IN STRUCTURES HAVE BEEN SUCCESSFULLY BUILT.	SOME EQUIPMENT PROBLEMS HAVE BEEN ENCOUNTERED.
WEIGHTED VALUE (ADJ^2. X VAL^1.)						
SUMMATION OF VALUE						